Heart Rate and Rhythm Response to Waterslides in Healthy Young Adults

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Background In recent years, water parks have become increasingly popular attractions. The term 'water slide' has been expanded to include rides with twists, turns, loops, drops, and other thrill-inducing features. These high-tech rides raise concerns about safety, and although few incidents are reported, the investigators have cared for two children with aborted sudden deaths at waterparks related to previously unrecognized arrhythmias. There is no published data on how water parks and slides impact heart rate and rhythm. The limited data available for roller coasters suggests that the maximum observed heart rates occur in anticipation, rather than during the roller coaster ride.

Methods Nine subjects from 20 to 24 years of age were recruited. The subjects were screened with the American Heart Association pre-participation questionnaire, medication history, physical exam, 12 lead ECG, and a limited echocardiogram. These tests were done to ensure that the subjects would not be endangered by the experiment, and also that they could provide usable data.

Heart rate and rhythm data was collected during waterpark activities using a water-resistant Holter monitor (MyPatch, DMS Service, Los Angeles, CA). There were six situations in which heart rate was recorded: twice on a speed slide with a 106 stair ascent, and once on an aqualoop slide with a 106 stair ascent, a serpentine tube slide with an 83 step ascent, and a serpentine tube slide with a 60 stair ascent, followed by a five minute sitting rest period.

The ECG data was evaluated for arrhythmia and maximum heart rate before and after each slide, Maximum observed heart rates were compared to the age-predicted maximum heart rate (APMHR) (220-age in years).

Results Out of the nine subjects, two were male and seven were female, and the average age was 22.2 years. Artifact prevented analysis in 1 of the 45 water slide samples.

No significant arrhythmias were detected. The maximum heart rate achieved by each subject ranged from 157-192, averaging 90.3% of their APMHR (range 79.3% to 97.0% of APMHR). 8/9 subjects exceeded 85% of their APMHR, five exceeded 90%, and two exceeded 95% of their APMHR. In 39/44 samples, the maximum heart rate observed was seen prior to the slide. The highest heart rates were seen with the speed and aqualoop slides.

slide	speed pre	speed post	loop pre	loop post	tube pre	tube post	body pre	body post		rest		% Age Predicted Max
ave.	**171.61**	**150.39**	**172.78**	**162.67**	**164.38**	**132.50**	**160.56**	**144.44**		**86.22**		90.34%
min.	127	107	157	123	138	111	133	111		64		79.29%
max.	192	178	185	186	186	145	176	165		106		96.97%
# stairs	106		106		83		60					

Conclusion All but one subject exceeded 85% of their APMHR at least once during one of the five water slides, with the highest heart rates generally seen prior to the slide itself. These elevated heart rates are presumably caused by the combination of exertion and anticipation that comes with a water slide. This data suggests that water slide activities may represent a unique combination of risks to those individuals with catecholamine sensitive arrhythmias.